



EE/CA SUPPORT SAMPLING PLAN

FOR

REMOVAL ACTIVITIES

AT THE

TOLEDO TIE TREATMENT SITE

LOCATED AT

**ARCO INDUSTRIAL PARK
TOLEDO, OHIO**

MARCH 1998

Prepared For:

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March 2, 1998

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RE: Toledo Tie Treatment Site, EE/CA Support Sampling Plan per Unilateral Administrative Order, Docket No. V-W-98-C-444; PWM001D.006.

Dear Mr. Dollhopf and Ms. Orr:

The following document is being submitted to the United States Environmental Protection Agency (EPA) pursuant to Section V, 3.1 of the Unilateral Administrative Order (UAO) issued to Kerr-McGee Chemical LLC on December 24, 1997 for the Toledo Tie Treatment Site in Toledo, Ohio.

1. EE/CA Support Sampling Plan.

We trust that this submittal fulfills the requirements of the UAO with respect to the schedule defined in the order.

Please feel free to contact Mr. Peter Goetz, Project Coordinator or myself, if you have any questions or require additional information.

Respectfully submitted,

Scott F. Lockhart, P.E.
Senior Project Manager

Enclosure

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1.0 INTRODUCTION

1.1 General

Kerr-McGee Chemical, LLC (Kerr-McGee) was issued a Unilateral Administrative Order (UAO), dated December 24, 1997, pursuant to Section 106 (a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) pertaining to the Toledo Tie Treatment Site (Site), which is located in and near the Arco Industrial Park in Toledo, Ohio (Figure 1). The Site was formerly operated as a wood treating facility, which primarily used creosote related contaminants to treat wooden railroad ties.

The UAO, with an effective date of January 20, 1998, requires Kerr-McGee to "*conduct removal activities to abate an imminent and substantial endangerment to the public health, welfare or environment that may be presented by the actual or threatened release of hazardous substances at or from the Toledo Tie Treatment Site.*" Eight response activities as described in Section V 3.1 through 3.8 of the UAO are required to be conducted. The first seven response activities (Section V 3.1 - 3.7) are addressed in the Removal Action Work Plan (HAI Document #PWM001D.002) and Field Sampling and Analysis Plan (HAI Document #PWM001D.003) dated February 1998. These documents were submitted to the U.S. EPA on February 19, 1998.

This document addresses response activity 3.8 of the UAO which requires Kerr-McGee to "*conduct investigation activities necessary to support an Engineering Evaluation/Cost Analysis (EE/CA) for consideration of non-time critical alternatives for removal and stabilization of remaining sources of coal tar creosote and related hazardous substance contamination to soil, sediments and surface water at the Site and complete an EE/CA Report consistent with U.S. EPA guidance entitled, "Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA," EPA/540-R-93-057, Publication 9350.32, PB 93-963402, dated August 1993.*"

1.2 Purpose and Objectives

As described in the Scope of Work (SOW) dated December 16, 1997, attached to the UAO, the following four tasks are to be completed under removal activity 3.8:

1. Task 1 - EE/CA Support Sampling Plan (SSP)
2. Task 2 - EE/CA Support Sampling
3. Task 3 - Data Report; and
4. Task 4 - EE/CA.

This document is the EE/CA SSP. The objectives of the EE/CA SSP are to further determine the extent of contamination for the purpose of identifying source areas at the Site beyond that already identified by other Site investigation data, and to gather data necessary to analyze and evaluate removal alternatives. This plan contains a description of equipment specifications, required analyses, sample types, and sample locations and frequency. It also addresses specific hydrologic and hydrogeologic characterization methods, and data requirements for removal technologies that will be evaluated in the EE/CA. Whenever appropriate, references have been made to HAI Standard Operating Procedures (SOPs) provided in Appendix A. While this document details sampling and analysis procedures, it is not meant to be a stand-alone document, and should be used in conjunction with the Quality Assurance Project Plan (HAI Document # PWM001D.001), included as Appendix C of the Removal Action Work Plan (HAI Document #PWM001D.002).

Under the EE/CA Scope of Work of the UAO, the SSP must investigate the following areas which are shown on Figure 2:

*not
act*

1. Former location of Williams Ditch;
2. Former Creosoting Plant and Tanks Area;
3. Former Treated Railroad Tie Storage Area;
4. Stockpiled Material on property along Frenchmens Road; and
5. Access Road (Creosote Road).

Pursuant to the precepts of the Superfund Accelerated Cleanup Model (SACM) and the EE/CA, existing data will be used to the maximum extent practical. These data include technical reports currently lodged in the Administrative Record and background information in the files of the Ohio EPA, Division of Emergency and Remedial Response. Existing hydrogeologic information will be evaluated to determine the additional data required to define the distribution of creosote related contamination as necessary for the purpose of implementing appropriate removal actions in these areas.

1.3 Data Gathering Objectives

Although there have been limited environmental investigations at or near the Site as discussed in Section 2.0, the data is insufficient to effectively evaluate removal alternatives. The EE/CA field sampling will provide the requisite data and is flexible to allow modifications in sampling locations, depths, etc. based on observed conditions during field activities. The objectives of the data collection are to:

1. characterize suspected waste soil piles behind the Spartan Chemical Warehouse for potential treatment and disposal.
2. define the hydrogeologic conditions in the uppermost saturated lacustrine zone at and near the Site, including but not limited to flow direction, discharge/exchange areas, and local groundwater uses. The distribution of creosote related contaminants in the lacustrine zone will be evaluated as will the pollutant mobility and potential hazards to exposed receptors;

how many
ft?
p170 meters

3. define the extent of coal tar creosote related contaminants in surface and subsurface soils at the Site, including potential contamination in sediments in the former location of Williams Ditch; and
4. evaluate removal alternatives which may be implemented.

East side of facility does not appear to be subject to additional

1.4 Project Team

The sampling team will consist of a field operations coordinator (team leader) and a technical support group. The sample team leader's responsibilities will consist of ensuring that data are collected within the constraints of this plan and the QAPP (HAI Document #PWM001D.001); maintaining primary communications between the sample team and project manager; and reporting potential health and safety threats imposed by equipment, weather, geography, or hazardous materials. A core project team has been selected based on individual project experience related to the specific tasks required. Additional HAI personnel and subcontractors will also be used as necessary to complete the work. A brief description of each core team member's project responsibilities is provided in the Removal Activities Work Plan (HAI Document #PWM001D.002).

see doc

1.5 Special Considerations

Access will likely be tenuous because the Site is comprised of numerous parcels, each with different owners, and each conducting different businesses. Therefore, consistent with the Community Relations Plan being developed for the removal activities, an informational meeting will be held with the property owners, business personnel, and other interested persons. The meeting will familiarize neighboring businesses with the investigative activities and the work schedule, and it will also allow coordination of project activities that may ultimately interfere with traffic and/or normal business operations. Presumably, the timing and context of the meeting will be coordinated with the U.S. EPA. Details covered by this meeting will include safety issues, site access requirements, decontamination procedures, extraneous materials storage, drilling techniques, and other field methods.

when talk to subs about this not in plan Is subs aware?

1.6 Summary of EE/CA Approach

The overall approach to completing the EE/CA will be consistent with the U.S. EPA guidance document "*Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA*" EPA/540-R-93-057, August 1993. There are five areas of concern within the Site that have been identified by the U.S. EPA in the UAO. A combination of geophysical and intrusive techniques will be used to acquire data from these areas to support the evaluation of alternatives to address creosote related contamination remaining at the Site following the time-critical removal action. Geographic Information Systems/Global Positioning Systems (GIS/GPS) will be used to develop a historical overview of Site development and to manage the data which will be generated. Qualitative analysis including laser-induced florescence (LIF) and cone penetrometer testing (CPT) will be used in conjunction with conventional sampling and analysis to determine the distribution of contamination and establish a risk-based removal alternative. This approach has been selected because it will provide the greatest amount of data in the shortest period of time. Furthermore, this approach has been successfully demonstrated on other wood-treating sites and the technology has received a verification statement from the U.S. EPA Environmental Technology Verification Program (EPA-VS-SCM-01). The implementation of field work to support the EE/CA will be coordinated to the maximum extent practical with that being conducted for the time-critical portion of the removal action. This will result in a more complete characterization of the Site, thereby allowing the selection of the most effective removal strategy.

Finally, the data will be used to evaluate removal technologies including presumptive remedies and other innovative technologies. The EE/CA sampling program is intended to be flexible, in order to respond to field conditions encountered.

check to see if these are others being existing who is this going to be separate can't be to stay or schedule

2.0 SITE INFORMATION

2.1 Site Location and History

The Site encompasses over 50 acres and is located in the City of Toledo, Lucas County, Ohio as shown on Figure 1. The Site was owned and operated by Federal Creosoting Company from approximately 1923 to 1959, and American Creosoting Corporation from 1959 to 1962 treated railroad ties. Operations ceased in 1962 when the Site was sold to the City of Toledo. In 1969, the Site was sold to Arco Reality, Inc. and was subdivided into a number of parcels and developed as a business and industrial park.

Wooden railroad ties were treated with coal tar creosote at the Site. Based on aerial photographs, a generalized wood-treating operations map was created (Figure 2). Figure 2 illustrates that untreated lumber was stored in the eastern section of the Site, and treated wood was likely stored in the western section of the Site. In a typical wood treating operation, treated wood was stored on flatbed rail cars and allowed to drip dry. An above-ground tank farm was located in the central southern section of the Site, south of the access road formerly known as Creosote Road. The tank farm consisted of two 500,000 gallon, three 30,000 gallon, and four 150,000 gallon creosote tanks, and one 150,000 gallon zinc chloride tank. Lagoons were located in the central section of the Site, north of the access road. The lagoons, east of Arco Drive and south of Frenchmens Road, were filled between 1969 and 1972 based on aerial photographs. A warehouse owned by Spartan Chemical is currently situated over a portion of one of the suspected lagoons.

Williams Ditch serves as the "natural drainage" in the area. When the Site was operated as a wood treating facility, the ditch ran southwest to northeast along the western section of the Site.

① 62-27
② city map
74x5
62-69
aerial photo
show
made by
city?
③ there is
no fig 2
④ which ones
are used
⑤ where
did this
come
from?
⑥ contend
offer
state own
⑦ implies this
is not
TRUB for

This should
be written
Are
lagoons
still
there

The ditch generally intersected what is now Arco Drive and Frenchmens Road at approximately a 45 degree angle. A portion of the ditch was rerouted during redevelopment of the area, presumably to align with individual parcel boundaries.

Aerial photos or photocopies of aerial photos from 1940, 1950, 1957, 1963, 1969, 1972, 1974, 1980, 1988, and 1998 are available to define locations of various areas of the former wood-treating facility. Geraghty & Miller (1990) conducted a fairly comprehensive review of historical photos and topographic maps. The results of this review are generally consistent with Site features presented on figures in reports from numerous investigations at or near the Site. However, there are some minor discrepancies with respect to exact location of some of the Site features such as the lagoons, due to interpretation of the photographs.

check this with the photos we have

The most recent site-specific topographic mapping, based upon available information, is a 1974 map prepared for the Lucas County Planning Commission. Other previous topographic information includes United States Geologic Survey maps from 1934, 1952, 1965 and 1980, however these maps lack detail. It is unknown whether there is existing Site ground control in place.

? what is this

2.2 Environmental Setting

The Site (Figure 1) is located on a relatively level piece of property approximately 4,500 feet north of Swan Creek and 8,000 feet south of the Ottawa River. The Site gently slopes toward Williams Ditch that crosses the Site from southwest to northeast. Elevations across the site range from 620 to 625 mean sea level (msl).

Schneider Ditch?

The Site lies within the Eastern Lake Plains of the Central Lowland physiographic province of North America. This glacio-lacustrine landscape typically possesses low relief and low elevation. This flat surface was created due to several widely spaced periods of continental glaciation that supplied the largely unsorted unstratified surficial drift deposits that cover the land in this area of the state.

During the most recent stages of ice retreat, released water became trapped between the retreating ice mass to the north and the glacial deposits to the south, and proglacial lakes formed. These lakes produced a thin veneer of lacustrine deposits over the glacial tills.

More specifically, the surficial lacustrine deposits consist of two distinct types: silt and clay deposits representing quiet water deposition and sand deposits representing higher energy environments (i.e. near shore). The lacustrine deposits are approximately 12 to 15 feet thick at the Site and range from silt to clay to sand. Ground-water levels in the uppermost saturated zone have been documented to be within 3-5 feet of the ground surface. Water table conditions exist across the Site, with stiff to very stiff glacial clay typically encountered at 12-15 feet beneath the lacustrine material. This till layer provides a low permeability barrier to vertical migration and the lacustrine till interface is a likely migration pathway for lateral movement of groundwater and potential dense non-aqueous phase liquids (DNAPL).

that may be present

The Ohio Department of Natural Resources (ODNR) Division of Geological Survey Drift Thickness Map of Lucas County, Ohio (ODNR, 1985) indicates that the Site is located on the southern slope of a buried valley where the drift thickness is approximately 125 feet. The buried valley trace is from the southwest to the northeast and reaches a maximum depth of approximately 150 feet north of the Site. The glacial drift overlies Devonian limestone or dolomite bedrock.

The ODNR Ground-Water Resources Map of Lucas County indicates that the principal aquifer beneath the Site consists of the thin discontinuous sand and gravel lenses interbedded in the clay till filling the preglacial valley. Yields of approximately 10 to 20 gallons per minute (gpm) are encountered at depths of 120 feet or less. However, higher yields may be obtained from the underlying carbonate aquifer. The area in the vicinity of the Site is served by a municipal water supply system that draws water from Lake Erie, and local use of ground water for potable purposes is expected to be minimal, and possibly non-existent.

Industrial use?

849

A number of hydrogeologic investigations were conducted at the Site from 1987 to 1995. Results of soil, ground water, and surface water samples collected from the area indicated contamination from creosote compounds existed near the lagoons, above ground storage tanks, and Williams Ditch. Some of the individual polyaromatic hydrocarbons (PAHs) detected were naphthalene, benzo(a)pyrene, phenanthrene, chrysene, fluoranthene, acenaphthalene, pyrene, and dibenzo (a,h) anthracene. Concentrations were detected in the range of 100s to 1,000s of parts per million (ppm) in the soil, sediment, and surface water. Investigations conducted by the Ohio EPA in 1993 and the Ohio Department of Health in 1995 determined that sediments in some areas of Williams Ditch were saturated with creosote. References for previous environmental investigations can be found in Section 7 of the 1993 Site Inspection (SI) report prepared by the Ohio EPA. These reports are generally consistent in describing the geologic and hydrogeologic conditions at the Site. New data collected during implementation of the EE/CA will be used to supplement existing data to refine the understanding of subsurface conditions at the Site.

On September 25, 1997, following a significant rain event in Toledo, Ohio, the National Response Center was notified of the presence of a sheen of an unknown oil in Williams Ditch. On October 1, 1997, representatives of U.S. EPA Emergency Response Branch evaluated conditions in Williams Ditch and observed an oil sheen upgradient of the National Super Service storm sewer outfall to Williams Ditch. The sheen was very heavy in the ditch east of Arco Drive (50 to 100 feet) and north (50 to 100 feet) of the former location of the suspected creosote lagoon areas. This area of heavy sheening is where a storm sewer apparently runs through the former lagoon area to Williams Ditch. On October 10, 1997 Kerr McGee voluntarily initiated environmental response activities at the Site at the request of the U.S. EPA. Subsequent to the voluntary effort by Kerr McGee, five areas of the Site were identified by the U.S. EPA as targets for the EE/CA SSP.

Each area is briefly discussed below:

Former Location of Williams Ditch

Sections of Williams Ditch were rerouted after 1962 to facilitate property development. This investigation will attempt to locate the original sections of Williams Ditch and collect samples to determine if these areas are sources for contamination in Williams Ditch. Concentrations of PAHs in the sediments of Williams Ditch ranged from 180 to 270 ppm in previous investigations.

Former Creosoting Plant and Tank Area

Historic records and aerial photographs indicate that a tank farm comprised of two 500,000 gallon, three 30,000 gallon, and four 150,000 gallon creosote tanks and one 150,000 gallon zinc chloride tank existed on the site. The aerials also appear to indicate the presence of stained soils around the plant and tank area, although some of the stained soil may be cinders from the operations of coal fired trains near on-site tracks or treatment areas. Currently this area is wooded and is sparsely covered with debris piles consisting of bricks, railroad ties, concrete rubble and fragments of tar in a dark brown to black, fine grained soil matrix.

Former Treated Railroad Tie Storage Area

A 1957 aerial photograph indicates numerous stacks of treated lumber west of the treatment plant/tank area. The largest number of the treated lumber stacks appear to be located just west of the former Williams Ditch, north of Arco Drive, and extend all the way to Byrne Road. Analytical results of soil samples collected from recent property assessments indicate the presence of phenanthrene (1.56 ppm) and carbazole (0.046 ppm) in this area.

Stockpiled Material on Properties Along Frenchmens Road

These stockpiled material piles are located behind the warehouse located at 3243 Frenchmens Road. The stockpiled area is currently wooded and the piles of material are comprised of bricks, railroad

① may have been done by the City of Tol

9 tanks

500 x 2 = 1000
30 x 3 = 90
150 x 4 = 600
1690

① would zinc chloride present a health risk
② ARE we very concerned about sampling that will allow us to determine

Does not deal with west side of road - typical of better area?

ties, concrete rubble and fragments of tar in a dark brown to black, fine grained soil matrix. Samples of this material collected during a 1990 site assessment indicated the presence of four PAH compounds ranging in concentration from 110 to 720 ppm.

Former Access Road (Creosote Road)

Based on a 1963 aerial photograph of the Site, the former Access Road or Creosote Road occupied approximately the same space currently held by Elmdale Road until just before the intersection of Elmdale and Frenchmens Road. At this point, the access road turns east-northeast and extends approximately 400 feet before making a 90-degree turn toward the south-southeast. Following the 90-degree turn to the south, the road extends approximately 300 feet, at this point it intersects an east-northeast/west-southwest trending road, stretching from the railroad tracks to the east, to just west of the former creosoting plant and tanks.

3.0 CHEMICALS OF CONCERN

The chemicals of concern (COCs) for the EE/CA SSP are based on previous investigations, available data regarding the past use of the Site and the objective of this plan. The purpose of the removal action mandated by the UAO is to address creosote related contamination in soil, sediment and surface water at the Site. The predominant COCs are polynuclear aromatic hydrocarbons (PAHs) ~~which are the primary components of coal tar creosote.~~ PAHs have been selected as COCs because:

1. historical information indicates wood-preserving operations, using creosote were conducted at the Site;
2. previous environmental investigations have indicated the presence of PAHs in the subsurface and surficial soils, sediment in Williams Ditch and surface water of Williams Ditch;
3. dense-non-aqueous phase liquids (DNAPL) have migrated towards Williams Ditch.

In addition to PAHs, the eight RCRA metals are selected for evaluating the waste soil piles behind the Spartan Chemical building. Metals are selected as COCs for this area only to support characterization for potential treatment and/or disposal considerations. The samples will be analyzed for metals following the toxicity characterized leaching procedure (TCLP). There may be additional characterization required by an off-site receiving facility, if used.

creosote
operations
would include
zinc and
lead?

good enough

① Is this because metals might affect treatment options?
② why aren't we testing for metals in former creosoting plant and tank area?
③ what type of sampling are recommended here?

4.0 SOIL AND SEDIMENT INVESTIGATION

4.1 Soil Boring and Subsurface Investigation

The subsurface investigation consists of data collection to evaluate the subsurface stratigraphy, in the upper unconsolidated material, determine the extent of contaminant distribution, and define geological influences that may control ground-water flow or contaminant transport. Direct collection methods including borings, test pits, and field and laboratory analysis of subsurface materials will be used to identify the lateral and vertical extent of the Site's subsurface materials. Indirect data collection methods (geophysical, aerial imagery, and cone penetration techniques) will supplement direct data collection, where applicable, to limit the amount of intrusive activities and investigation-derived wastes.

4.2 Sample Locations and Frequency

The EE/CA (SSP) activities for soil consist of using aerial imagery, Cone Penetrometer Technique/Laser Induced Fluorescence (CPT/LIF), soil borings, test pits, and geophysical techniques. Each of the areas of concern, as illustrated on Figure 2, will use one or a combination of these techniques based on historic property use, current access issues, and size of objects of concern. Thus, proposed boring grids vary in each area based on these issues. The data collection grid spacing and data collection methods for each area are defined in the following sections.

The depth of each boring will be determined by the following criteria, unless otherwise specified.

1. borings will be advanced until CPT/LIF signature indicates the lack of creosote or until the base of the uppermost saturated unit (top of till) is encountered; or
2. if the till is fractured, then the boring will be advanced to the base of the fractures;
or
3. if the borings penetrate the till, then all drilling operations will be stopped until new drilling procedures can be applied that will protect any underlying saturated units. *sub?*

Please note that the sampling locations are proposed, and the exact number and location of these sampling points may change based on field observations. Sample identification nomenclature is subject to change based on the laboratory's data base limitations.

4.2.1 Former Location of Williams Ditch

The location of the former Williams Ditch has been approximately defined using aerial photographs. Ground penetrating radar (GPR) will be used to more precisely locate the former ditch. Once GPR has established the exact location of the former ditch, then CPT borings will be installed on approximately 300 foot centers (where existing conditions allow) along the length of the ditch, to a depth of approximately 15 feet or until suspected ditch sediments are penetrated. LIF will be used as a field screening tool to access the distribution of creosote compounds, if any. Confirmation soil samples will be collected in a minimum of 25 percent of the CPT/LIF borings.

① why only 15 ft
② add if existing conditions don't allow?

The approximate location of the GPR profiles and CPT/LIF borings are illustrated on Figure 3. The GPR profile and CPT/LIF boring locations are designated GPR-1 through GPR-10 and FWD-1 through FWD-10, respectively.

4.2.2 Former Creosoting Plant and Tank Area

Due to the size and ease of locating the former creosoting plant and tank area, the area soils will be characterized using CPT/LIF borings. The proposed boring location grid is comprised of approximately 25 15-foot deep borings placed on approximately 100 foot centers as presented on Figure 3. These locations are designated AST-1 through AST-25. Confirmation soil samples will be collected from a minimum of 25 percent of the CPT/LIF borings. Aerial photos show a surface feature which is suspected of being a drainage pathway from the former tank area to one of the wastewater lagoons. CPT/LIF borings will be placed along its length for confirmation.

again 15 ft
where is this at on map?

4.2.3 Former Treated Railroad Tie Storage Area

In the former treated railroad tie storage area, soils will be characterized using CPT/LIF borings. The proposed boring location grid is comprised of approximately 39 15-foot deep borings placed on approximately 100 foot centers, as presented on Figure 3. These locations are designated TIE-1 through TIE-25. Confirmation soil samples will be collected in at least 25 percent of the CPT/LIF borings.

4.2.4 Stockpiled Material Along Frenchmens Road

The approximate location of stockpiled material is illustrated on Figure 2. The location of this material is easily identified in the field. However, the exact source of the stockpiled materials is unclear. Also, the composition of the piles makes sample collection difficult. Therefore, a backhoe will be used to trench across these piles in three locations, as illustrated on Figure 3. Samples of the pile material will be composited and submitted for waste characterization, treatment, and/or disposal evaluation purposes. The soil from directly below the piles at each trench will be sampled and submitted for chemical analysis for PAHs. Data will be collected to supplement information documented in the Geraghty & Miller report dated October 1990 and the Site Inspection (SI) Report by Ohio EPA (1993).

4.2.5 Former Access Road (Creosote Road)

The location of the former Access Road has been approximately defined using aerial photographs. However, based on the size of the former road and the limited number of current landmarks, the location of the road must be transferred from the aerial photographs to the Site using accurate surveying techniques. When this is accomplished, hand augered borings will be used to collect shallow (less than 3 feet) soil samples every 300 feet along the road. Figure 3 illustrates the approximate location of the Access Road soil sample.

4.3 Sample Identification (Labeling) and Designation (Numbering)

Soil samples will be identified according to the following Sample Identification Number (SIN) as stated in Section C.4.2.3 of the QAPP (HAI Document #PWM001D.001). An example of a valid SIN for a soil sample would be as follows:

PWM001	LG01	SS001	D157	
			+-----	Employee Number
		+-----		Soil Sample Location
	+-----			Area of Concern & Boring Number
+-----				Project Number

The identification will provide the project number, the area of concern, boring number, sample number (e.g., soil sample location), and identification of the sample collector. Note: Sample identification nomenclature may change based on data base limitations.

4.4 Sampling Equipment, Supplies, and Instrumentation

Soil samples will be collected using one of the methods described in this section. The physical characteristics of the unconsolidated materials will be evaluated using either visual or CPT/LIF technology.

4.4.1 CPT/LIF

Each boring will be continuously measured using a CPT deployed LIF to a depth of approximately 15 feet. In accordance with ASTM Standard D 3441, the cone is typically advanced at a rate of 2 centimeters per second with the driving force of hydraulic rams. Simultaneously with the CPT push, LIF spectroscopy will be used to determine the presence of creosote in the soil. The boring information will delineate the horizontal and vertical distribution of creosote compounds in each area of concern.

4.4.2 Hollow Stem Auger Drilling

Hollow stem augering (HSA) will be performed in accordance with HAI SOP No. F2000 (Appendix A) following ASTM D 1586-84, Method for Penetration Test and Split Barrel Sampling of Soils.

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4.4.3 Split Spoon Soil Sampling

Split barrel soil sampling is explained in HAI SOP No. F3000 which is in accordance with ASTM Method D 1586-84. Each soil boring which uses HSA techniques will be sampled continuously. Standard Penetration Test (SPT) data shall be collected on the boring log by the field geologist.

4.4.4 Shelby Tube Sampling

Relatively undisturbed soil samples will be collected using a thin-walled Shelby tube in accordance with ASTM D 1587-83 and HAI SOP No. F3001. Two Shelby tube samples will be taken from the cohesive soils (till) below the upper-most saturated zone to characterize the lower confining unit. Additional samples may be collected at locations as directed by the Project Manager.

4.4.5 Hand Auger Drilling

Hand augering will be performed using a barrel auger in accordance with HAI SOP No. F3002 (Appendix A) following ASTM D 4700-91, Standard Guide for Soil Sampling from the Vadose Zone and ASTM D1452-95, Practice for Soil Investigation and Sampling by Auger Borings.

4.4.6 Test Pits

A backhoe will be used to install test pits for soils collection. Excavation through the waste soil pile, at each of the three test locations, will occur until native soil is reached. Because the horizontal extent of the debris piles is easily defined, the test pits will only be used to define the vertical extent of the debris piles and to characterize the debris. Since the debris piles will not be altered other than being moved from their original location, the material will be left in place until characterization is completed.

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4.4.7 Ground Penetrating Radar

HAI will use ground penetrating radar (GPR) to locate the former Williams Ditch. GPR methods project high frequency radio waves into the subsurface to detect interfaces between materials with different physical characteristics (primarily dielectric properties). When the waves encounter bedding planes, fractures, moisture, voids, and other nature and man-made differences, they are reflected back. The travel time of the waves is recorded and a profile is produced. The exact equipment and methods to be used for this application are based on very specific site conditions. Therefore, a field test is required to determine applicability and effectiveness.

4.5 Sample Handling, Preservation Methods, and Blank Samples

For quality assurance purposes, one field blank will be collected for every 20 samples analyzed or a minimum of one per day. The sample will be collected by decontaminating the sampler according to HAI SOP No. F1000 and then passing laboratory-supplied water through the sampler. The water will be collected in the properly preserved containers specified in Table C.2 of the QAPP (HAI Document #PWM001T.). The sample will be analyzed for the same parameters described in Section 5.6.

Samples collected for chemical or physical analysis will be stored in a manner to prevent the samples from freezing in cold weather. Samples collected in weather conditions above freezing for chemical analysis will be stored near 4°C by placing them on ice in an insulated container after the samples are collected.

4.6 Sample Analysis Parameters

Soil samples will be analyzed for PAHs in accordance with U.S. EPA Method OLM03.2, and in the case of the waste soil pile metals, in accordance with U.S. EPA Methods 6000 and 7000 Series. Table C.2 of the QAPP (HAI Document #PWM001D.001) identifies the analytical methods, data quality objectives, and QA/QC protocol for each sample matrix and location.

To assist with contaminant transport modeling, samples will be analyzed for total organic carbon (TOC) in accordance with Walkley Black Method. Up to five geotechnical analyses will be conducted including USCS classification by ASTM D 2487; vertical permeability ASTM D5084; dry/wet density ASTM D2216, and specific gravity, ASTM D584.

4.7 Chain-of-Custody

The chain-of-custody will trace possession and handling of individual samples from the time of field collection through laboratory delivery and analysis. The chain-of-custody program consist of procedures for sample labeling, sample sealing, field log recording, record keeping, and laboratory logging.

Sample Labeling - All sample labels will contain the following information:

- Project number
- Soil Boring
- Sample number
- Name of the collector

The record keeping, sample seals, field log recording, and the laboratory logbook will adhere to the same procedures described in Section A.2.6.

4.8 Soil Classification and Field Description Log

Samples will be classified in the field according to HAI SOP No. F1006 following Standard D2487-93.

4.9 Decontamination of Equipment

The soil sampling and profiling equipment will be decontaminated in accordance with HAI SOP No. F1000. The decontamination rinse water will be collected, containerized, and stored until proper disposal can be arranged.

4.10 Disposal of Unused Soil Samples

Extraneous soils that remain following sample collection will be properly stored in DOT approved 55-gallon drums and secured according to HAI SOP No. F2013. The drums will be clearly labeled with a permanent marker or paint pen. Label information will consist of Site Identification, type of material, generation date, and sampler's initials. The material in the drums will be characterized as discussed in Section 7.0. This is investigation derived waste and it is not considered a RCRA listed waste, but will be analyzed to determine if it is a characteristically hazardous waste under RCRA. The time frame for treatment and/or disposal will be based on the characterization.

Documentation will consist of completing a chain-of-custody record as described in HAI SOP No. F3014 and Section C.5.0 of the QAPP (HAI Document No. PWM001D.001). The drums represented by each composite sample will be noted on the "comments" section of the chain-of-custody.

4.11 Decommissioning of Soil Borings

The soil borings that are not converted to piezometers will be decommissioned according to HAI SOP No. F2002. If no significant caving occurs, the soil boring will be decommissioned with hydrated bentonite chips as directed by the field hydrogeologist. The surface will be finished to grade with concrete or vegetative soil commensurate with the original surface conditions.

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5.0 HYDROGEOLOGIC INVESTIGATION

5.1 Objectives

The hydrogeologic investigation activities consist of installing piezometers collecting representative ground-water data, pH, temperature, DO, conductivity, the presence of immiscible layers of non-aqueous phase liquid, and conducting in-situ tests (i.e. slug test) to evaluate ground-water quality and hydrogeologic characteristics of the uppermost saturated lacustrine zone. The investigation will define:

1. the location of water-bearing units and the presence or absence of confining layers in the unconsolidated material;
2. characteristics by conducting slug tests in select piezometers;
3. the general flow direction and gradient of ground water in the first saturated zone encountered; and,
4. the distribution of creosote related contaminants in the uppermost saturated zone.

CPT/LIF techniques will be used to optimally locate piezometers which will be used to evaluate the presence or lack thereof of DNAPL.

5.2 Piezometer Construction and Installation Procedures

5.2.1 Piezometer Locations

Approximately eight piezometers will be installed into the uppermost saturated unit. The exact location of these piezometers will be determined based on the CPT/ LIF screening information regarding identified areas, sources and source areas, the need to define the distribution of creosote related contaminants in ground water and the need to evaluate ground-water flow. Piezometers will

be installed to monitor the upper saturated zone, and actual screen depths will be determined in the field by the field hydrogeologist based on the soil boring criteria outlined in Section 4.2. The proposed piezometer locations are shown on Figure 4.

5.2.2 Piezometer Designation (Numbering)

Piezometers will be numbered sequentially beginning with PZ-1 and may not correspond with a boring number.

5.2.3 Piezometer Installation, Equipment, and Procedures

5.2.3.1 Hollow Stem Auger Drilling

Piezometers will be installed using hollow stem augers in accordance with HAI SOP No. F2000.

5.2.3.2 Piezometer Construction Specifications

Each piezometer will be installed in accordance with HAI SOP No. F2006. The piezometers will be constructed with 2-inch diameter Schedule 40 PVC casing and 0.010-inch slotted screens. If free product is encountered during installation stainless steel may be considered for the primary construction material.

5.2.3.3 Piezometer Development

Piezometer will be developed in a manner consistent with U.S. EPA Technical Enforcement Guidance Document (TEGD) protocol. Piezometer development methods consist of other bailing, surging, or over-pumping. The method used for each particular well will be determined by HAI based on field conditions. Water generated during development and slug tests will be contained in DOT approved 55 gallon steel drums and stored for proper disposal.

Prior to and following piezometer development, relative ground-water levels and depths to water/product interfaces (if present) will be measured using an electric water level indicator/interface probe. The water level will be measured relative to a marked surveyed point on the top of the piezometer casing (TOC). The TOC survey will be established with a common horizontal and vertical datum established for the Site.

Proper piezometer development consists of surging, then removing a minimum of three to five piezometer volumes. Notes regarding the relative turbidity (visual), temperature, pH, and conductivity will be recorded following each piezometer volume. If a piezometer bails dry prior to removing the three to five well volumes, then an attempt will be made to redevelop the piezometer after recovery. If recovery exceeds a reasonable time period (four to eight hours) then the piezometer will be considered developed.

5.3 Piezometer Well Sampling

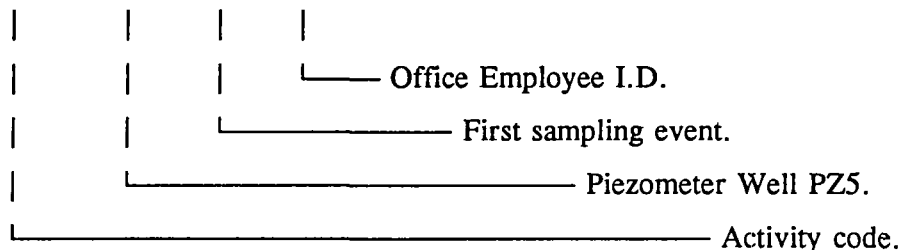
5.3.1 Sample Locations and Frequency

Ground-water data from the newly installed piezometers will be collected and will consist of measuring water levels and immiscible layers (if present), purging, sampling, and field analysis of pH, conductivity, dissolved oxygen and temperature. Further details of sampling procedures are outlined in the following discussions.

5.3.2 Sample Designation

Each ground-water data point will be identified according to the following SIN:

PWM001 - PZ5 - 001 - D157



Note: Sample designations may change based on data base limitation.

5.3.3 Sampling Equipment and Procedures

The procedures that will be performed at each include:

1. measuring for immiscible layers;
2. measuring the static water level;
3. purging the piezometer; and,
4. collecting the field ground water quality data from the piezometer.

5.3.3.1 Detection of Immiscible Layers

Floating (light phase) and/or sinking (dense phase) immiscible liquids, if present, will be measured in piezometers using an interface probe. Light non-aqueous phase liquids (LNAPL) will be detected by carefully lowering the interface probe down into the piezometer until the approximate static water level is reached (i.e., water/miscible layer interface). Dense non-aqueous phase liquids (DNAPL) will be detected by carefully lowering the probe to the bottom of the piezometer. See HAI SOP No. F3006 for a detailed description of the procedures used to detect immiscible layers.

Decontamination procedures in accordance with HAI SOP No. F1000 will be followed.

5.3.3.2 Water Level Measurements

An electric water level indicator will be used to measure the static water level elevation in each piezometer. As a substitute, an interface probe may also be used to obtain water level measurements. Ground-water measurements will be conducted in accordance with HAI SOP No. F3005. Each measurement will be recorded to the nearest 0.01 of one foot using the Site datum. Total depth measurements of the piezometer will also be taken with the water level indicator. However, it will be necessary to add a correction factor (the distance from the sensor to the tip of the probe) to the resulting measurement. In addition, piezometer volume will be calculated as discussed in HAI SOP No. F3007. A detailed description of the procedures to be used when collecting water samples is found in HAI SOP No. F3008.

Decontamination procedures, in accordance with HAI SOP No. F1000 will be followed.

5.3.3.3 Piezometer Evacuation (Purging)

Each piezometer will be purged prior to collecting data, in order to obtain a representative sample from the formation. HAI SOP No. F3007 outlines the appropriate purging procedures.

Clean surgical gloves will be worn by all personnel handling the purging equipment. Also, clean plastic sheeting will be placed around the piezometer in order to prevent the purging equipment from coming in contact with the ground.

A minimum of three piezometers volumes of water will be removed from the monitoring well prior to sampling. The piezometer will be purged in a manner that minimizes ground water agitation. Low yielding piezometer will be completely evacuated and sampled following adequate recovery. Temperature, pH, and specific conductance measurements will be recorded following each piezometer volume purged. The sampling equipment will be calibrated according to the manufacturer's specifications.

Piezometers may be purged using any of the following methods: a 2 inch *Grundfos* stainless steel submersible pump, a *Keck SP-84 Sampling-Pump System*, a *Voss* disposable polyethylene bailer, a *Waterra* hand pump or a *Brainard-Kilman pump*. If the total volume to be purged from the piezometer is less than 20 gallons, then it may be more efficient to purge the piezometer by hand using a bailer or the *Waterra* hand pump.

Purging equipment will be decontaminated with a non-phosphate detergent wash, followed by a potable water rinse, and a deionized water rinse. In order to further minimize the potential of carry-over contamination between piezometers, a small volume of potable water will be discharged through the purge pump and hose to flush the system as discussed in HAI SOP No. F1000.

Purge water will be containerized for proper disposal. The purge water generated from each piezometer will be stored on-site in DOT approved 55- gallon steel drums until disposal.

5.3.3.4 Sample Withdrawal

A *Voss* disposable, bottom valve bailer will be used for collecting data from each piezometer. A dedicated polypropylene rope or nylon string will be used to lower the bailer into the piezometer and collect the sample.

Clean gloves will be worn by each individual handling the samples and sampling equipment. Clean plastic sheeting will be placed on the ground near the piezometer to prevent the bailer from coming in contact with the ground. The following steps will be adhered to during sampling:

1. The integrity of the check valve for each bailer will be tested with deionized water to assure that no fouling problems exist that may reduce the delivery capability or result in aeration of the sample.

2. The bailer will not be dropped into the piezometer, as this may cause degassing of the water on impact.
3. The bailer contents will be transferred into the proper sample container in a manner which will minimize agitation and aeration.
4. In order to preserve sample quality, the sampling order will be as follows: non-volatile organic compounds, metals, and in-situ parameters (e.g., pH, specific conductance and temperature).

Used sampling equipment including string, gloves, or other protective clothing, will be properly disposed of following contact with the ground water. Waste sampling equipment will be temporarily stored in a plastic trash bag until it can be transported to the dedicated waste receptacle for storage at the Site.

5.4 Slug Tests

A slug test requires a rapid displacement of water in a piezometer, creating a distinct change in water level. The saturated zone response to this change in water level is a return to equilibrium (static water level). The rate of return to static conditions is a function of the hydraulic conductivity of the saturated horizon and the geometry of the monitoring well. In situ hydraulic conductivity tests will be performed in accordance with HAI SOP #F4002 to determine the hydraulic conductivity of the screened portion of the formation. The ~~Bouwer~~ Rice Method will be used to calculate hydraulic conductivities, which will be supported by Aqtesolve if required.

Slug tests will be performed on five representative piezometers. The test locations will be determined by the hydrogeologist following installation and development.

6.0 SURFACE WATER INVESTIGATION

6.1 Objectives

The surface water investigative activities consist of measuring water levels along Williams Ditch to determine stream gradients and the possible interconnectivity with the uppermost saturated zone. Quality is being addressed in the time-critical work plan.

6.2 Surface Water Sampling Procedures

6.2.1 Sample Locations and Frequency

Stream gauges SG-1 through SG-4 will be installed along Williams Ditch as indicated on Figure 4. The gauges will be used to determine the gradient of Williams Ditch from Byrne Road to Hill Avenue and be used in conjunction with data collected from the piezometers to define flow direction and gradient in the uppermost saturated lacustrine zone.

6.2.2 Measuring Equipment and Procedures

The procedures performed at each sampling location consist of installing a calibrated stream gauge, surveying, and periodically measuring and recording water levels. These items are discussed in the SOPs in Appendix A below and will be performed in the order that they are presented in this document.

7.0 INVESTIGATION DERIVED WASTE CHARACTERIZATION

Investigation derived wastes will be characterized for TCLP in accordance with EPA Method 1311 and subsequent analyses for volatile organic compounds (VOCs) by U.S. EPA Method 8260 and metals by U.S. EPA Methods 6000 and 7000 series. Ignitability, pH, cyanide and sulfides will also be analyzed. Additional analyses may be required by the accepting waste disposal facility for further characterization.

8.0 TESTS FOR REMOVAL ALTERNATIVES EVALUATION

The EE/CA will evaluate presumptive remedies for the removal actions for this Site. Samples will be analyzed, and potentially treatability studies will be conducted as part of this SSP to help assess the presumptive remedies. The presumptive remedies to be evaluated involve bioremediation, thermal desorption, immobilization, and incineration.

For the evaluation of bioremediation, up to five soil and/or sediment samples will be analyzed for indigenous microorganisms, moisture content, nutrients, organic content, particle size, and total organic carbon.

For the evaluation of thermal desorption and incineration, up to five soil and/or sediment samples will be analyzed for bulk density, metals, moisture content, particle size, pH, plasticity, total organic carbon, total chloride, and flash point.

For immobilization, up to five soil and/or sediment samples will be analyzed for cyanides, halide content, inorganic salts content, metals content, organic content, bulk density, particle size, and solids content.

9.0 SCHEDULE

9.0 Schedule

This section presents the project schedule for implementing the EE/CA SSP, preparation of a data report (Task 3 of the Scope of Work), and preparation of the EE/CA report (Task 4 of the Scope of Work). The schedule is shown on Figure 5.

After approval by U.S. EPA of this EE/CA SSP, the EE/CA report will be submitted to U.S. EPA within approximately 150 calendar days. Mobilization of off-site contractors to perform the CPT/LIF investigation will take approximately 3 weeks after receiving a notice to proceed. The UAO stipulated that the work plans be implemented "within 10 days of receipt of such approval in accordance with the schedule approved by the U.S. EPA." Field crews will initiate the Ground Penetrating Radar first while awaiting the arrival of the CPT/LIF crew.

Figure 5 shows that the field work for the SSP will be completed in approximately 8 weeks after work plan approval, and submittal of the data report will occur approximately 5 weeks later. Evaluation of the removal alternatives and submittal of the EE/CA report will occur 5 weeks following the data report submittal. Timely resolution of any access agreements will be important to keeping the schedule.

10.0 PROJECT MANAGEMENT TEAM

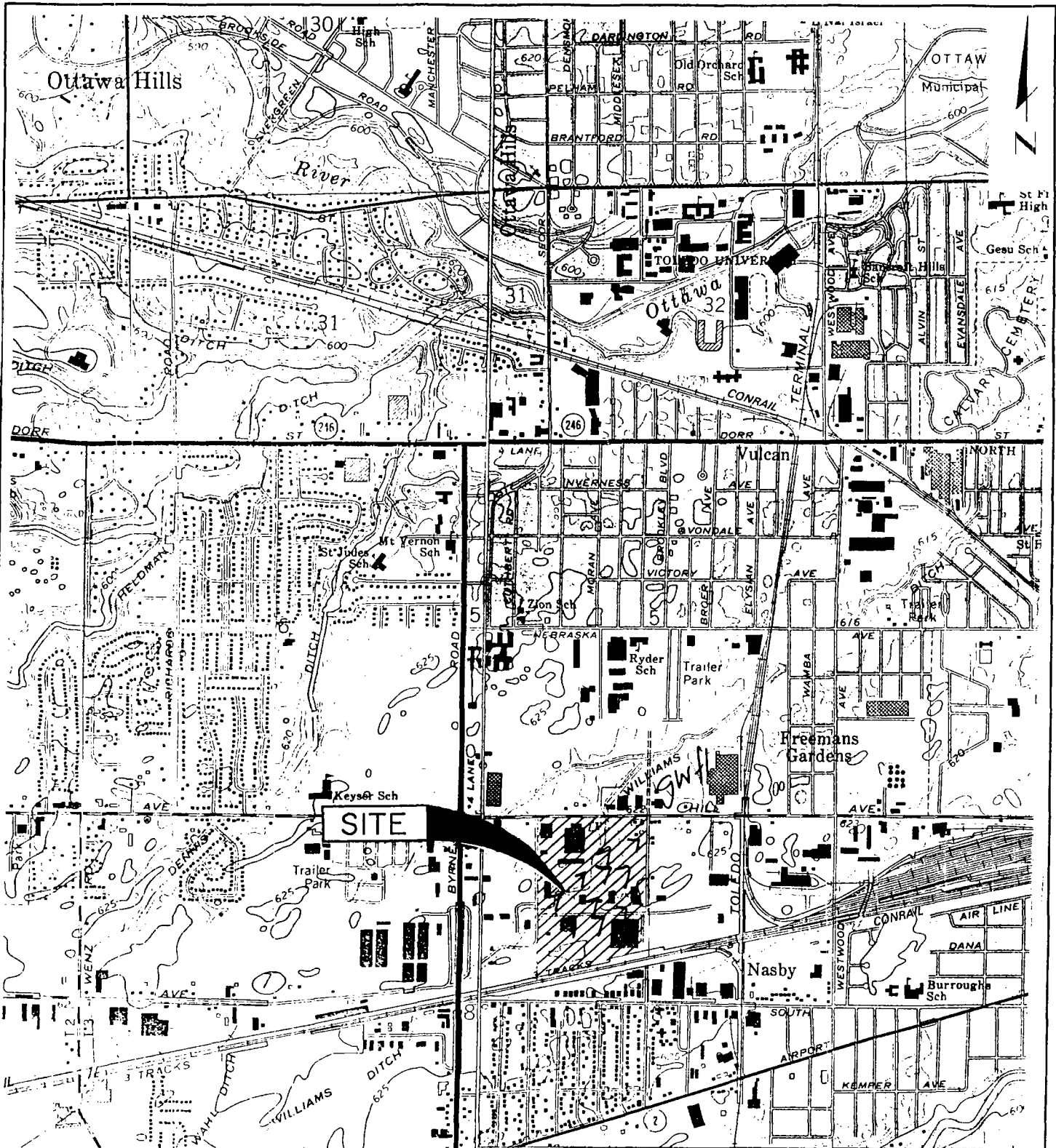
10.1 Project Personnel

<u>Personnel</u>	<u>Contact Number</u>	<u>Affiliation</u>
Ralph Dollhopf	313-692-7682	U.S. EPA On-Scene Coordinator
Deborah Orr	312-886-7576	U.S. EPA Remedial Project Manager
Ron Nabors	419-352-8461	Ohio EPA Project Contact
Peter Goetz	405-447-8300	Kerr-McGee Project Coordinator
	405-833-9009 (cellular)	
	888-732-8904 (pager)	
Scott Lockhart, PE	419-241-7171	Hull & Associates, Inc.
	419-323-1396 (pager)	Project Manager
Larry Smith	614-793-8777	Hull & Associates, EE/CA Team Leader
Kevin Wildman	614-739-8777	Hull & Associates, Inc. QA Officer
Jeff Arp	614-793-8777	Hull & Associates, Inc., Field Operations Coordinator
A. Keith Watson	405-270-3747	Kerr-McGee Project Manager
Christopher Schraff	614-227-2097	Legal Counsel for Kerr-McGee

Peter Goetz, as project coordinator, will serve as a central point of contact between Kerr-McGee and the U.S. EPA. He will provide review and coordination of HAI and other contractors which may be retained by Kerr-McGee to comply with the UAO.

Hull & Associates, Inc. has been retained by Kerr-McGee to complete the project plans required by Section V, Item 3 of the UAO. In this capacity, HAI will direct and coordinate the collection and evaluation of additional field data that will be needed to implement the tasks described in Section 1.0

of this work plan. Mr Scott Lockhart, P.E. will serve as the Project Manager for HAI and will be responsible for the technical and administrative aspects of the project, communication with the Project Coordinator and Kerr-McGee and coordination as needed with the U.S. EPA during the course of developing and implementing project plans. Technical support and peer review will be provided by Mr. Craig Kasper, P.E. of HAI.



SCALE: 1" = 2,000'
 SOURCE: USGS 7.5 MIN QUADRANGLE
 TOLEDO, OHIO - MICHIGAN 1965
 (PHOTOREVISED 1980)
 LATITUDE 41°37'30"
 LONGITUDE 83°30'
 SYLVANIA, OHIO - MICHIGAN 1965
 (PHOTOREVISED 1980)
 LATITUDE 39°57'38"
 LONGITUDE 83°05'42"

QUADRANGLE LOCATION

FIGURE 1

Huli & Associates, Inc.
 DUBLIN, OHIO

KERR-McGEE CHEMICALS, LLC.
 TOLEDO TIE TREATMENT SITE

SITE LOCATION MAP

CITY OF TOLEDO, LUCAS CO., OHIO

DATE:
 FEBRUARY 1998

PWM 001

ATTACHMENT A

Hull & Associates, Inc.
Standard Operating Procedure

SOP NO. F1000

Decontamination of Field Equipment

SOP No. F1000
DECONTAMINATION OF FIELD EQUIPMENT

1.0 Purpose

This section documents the procedures that will be followed when decontaminating field equipment. The equipment may include split spoon soil samplers, bailers, trowels, shovels, hand augers, drilling rigs, soil vapor sampling equipment, or any other type of reusable equipment used during field investigations.

In appropriate, decontamination will be performed as a quality assurance measure and safety precaution. Proper decontamination will be performed to minimize cross contamination between sampling locations or sampling intervals and transporting potentially contaminated materials off-site.

Decontamination of the drilling rigs, if appropriate, will be conducted in a designated decontamination area. Most smaller equipment (e.g., submersible pumps, etc.) can be decontaminated at the sampling location or between collection points. All decontamination materials that cannot be recycled will be properly packaged and disposed of based upon the nature of contamination.

2.0 Equipment and Materials

- High-pressure steam cleaner
- Cleaning fluids: non-phosphatic soap and/or detergents, potable water, distilled/deionized water, hydrochloric/nitric acid, isopropanol, acetone, methanol, and/or hexane
- Shovels and brushes
- Paper towels
- Disposable gloves
- Waste storage containers: plastic bags, drums, boxes
- Cleaning containers: plastic buckets, etc.
- Plastic sheeting
- Personal protective equipment

3.0 General

- A. All decontamination will be performed under the assumption that the equipment is contaminated.
- B. An adequate supply of all decontamination equipment and materials will be available on site.

4.0 Procedures

The following sections present the decontamination procedures that will be followed during the performance of all field tasks. If different or more extensive procedures are required, they will be pre-approved by the Project Manager and Quality Assurance Officer.

4.1 Drilling Rig and Associated Equipment

- A. All equipment associated with the selected drilling method coming in contact with potential contamination, both as part of subsurface equipment advancement and due to aboveground contact with drilling fluids, extracted soils, drill rig lubricants and fuels, etc., will be decontaminated prior to use of this equipment for soil boring advancement. At the discretion of the Project Manager, the entire drilling rig may be decontaminated due to foreign substances adhering to the rig as a result of operations, transport from off-site, or travel between soil boring locations.
- B. A high-pressure steam cleaner should be used to remove foreign material from inside and outside of drilling equipment that will not come into contact with test samples. Decontamination of sampling equipment (e.g., split-spoon samplers) is described in section 4.2.
- C. All liquid and solid material produced from this operation will be collected and properly contained.
- D. The date, time, and decontamination procedure used will be recorded on the boring log or daily field report or in a field notebook.

4.2 Split Spoon Barrel Sampler

To ensure that the potential for cross contamination is minimized during subsurface investigations, the split spoon sampler will be decontaminated between sampling intervals.

- A. After collecting the split spoon sample, the sampler will be disassembled and decontaminated by first physically removing any adhering soil material from the sampler.
- B. The sampler will be placed in a bucket containing a non-phosphatic soap solution (e.g., *Liquinox*) and scrubbed until visibly clean.
- C. The sampler will then be thoroughly rinsed with potable water until all soap solution is removed.
- D. The sampler will be reassembled.

4.3 Submersible Pump

This procedure will be employed to decontaminate the submersible pumps that are used in well purging and/or development operations.

- A. After removing the pump from the well, all exterior surfaces (the housing and hose) will be wiped with clean paper towels and placed on clean plastic. If any extraneous material is present on the outside of the pump or hose, it will be removed using a stiff brush.
- B. The pump will then be placed in a suitably sized container of non-phosphatic soap solution (e.g., *Liquinox*) and potable water. If possible, the pump will be turned on to circulate the solution through the pump.
- C. If sampling for metals, local sampling protocol may require that the pump will be placed in a bucket containing ten percent hydrochloric or nitric acid and, if possible, turned on to circulate the acid through the pump. If sampling for organics, local sampling protocol may also require placing the pump in solvent pesticide grade isopropanol, acetone, methanol, and/or hexane alone, or if required, in some combination, and turned on to circulate the solution through the pump. **The compatibility of any corrosive materials with the internal or external parts of the pump must be verified prior to their use. In addition, the use of flammable materials for decontamination is prohibited unless the pump is certified to be intrinsically safe.**
- D. Following each cleaning sequence described in B and C above, the pump will then be placed in a suitably sized container of clean potable or distilled water and then thoroughly rinsed. The pump will be turned on until the internal portion of the pump and tubing is free of cleaning solution; otherwise, the pump will be hand-circulated around the container and clean water will be cascaded into the pump. The outside of the pump housing will also be thoroughly rinsed with potable or distilled water. The last rinse applied to the pump system will always be distilled water.
- E. The pump and hosing will be properly stored to ensure that the system remains clean during transportation to other well heads. The pump and hosing will not be allowed to come in contact with the ground at any time during handling and transportation. If this occurs, the pump and tubing will be recleaned.
- F. All liquids and waste materials produced during this operation will be properly stored and disposed as determined by the Project Manager.

4.4 Bailers

This section documents the procedures that will be followed during the decontamination of re-useable bailers employed during purging or sampling operations.

- A. After removing a dedicated bailer from the well, or a non-dedicated bailer from its transport packaging, it will be wiped with clean paper towels and placed on clean plastic.
- B. The bailer will be scrubbed with non-phosphatic soap solution inside and out. The inside of the bailer will be scrubbed with a cylinder brush to ensure that interior walls are thoroughly cleaned.
- C. If sampling for metals, local sampling protocol may require that the bailer is rinsed with ten percent hydrochloric or nitric acid. If sampling for organic, local sampling protocol may also require that the bailer be rinsed with solvent-grade isopropanol, acetone, methanol, and/or hexane alone, or if required, in some combination.
- D. Following completion of each cleaning sequence described above in B and C, the bailer will be rinsed with potable (as approved by the Project Manager) or distilled water until it is free of the soap solution.
- E. The bailer will then be wiped dry using paper towels.
- F. The bailer will be properly stored and the bailer cord properly disposed of to prevent contamination from occurring between sampling locations. To properly store the bailer, the entire bailer will be placed in its dedicated PVC storage tube or wrapped in inert material (e.g., *Saran* wrap, aluminum foil, etc.).
- G. All paper towels and plastic sheeting used during decontamination procedures will be placed in a trash bag and properly disposed. Liquids used for decontamination of the bailers will be collected, properly stored, and disposed of as directed by the Project Manager.

4.5 Soil Gas Sampling Equipment

This section documents the procedures that will be adhered to during the decontamination of soil gas survey equipment between sampling locations.

- A. Any extraneous soil material on the sampling rods will be removed prior to washing the rods.
- B. The collection rods, nipples, and shield point adapter will be placed in a suitably sized container and thoroughly scrubbed with a brush and non-phosphatic soap (e.g., *Liquinox*) solution.

- C. The parts will be completely rinsed with distilled water until all residue of the soap solution is removed.
- D. The collection rods will be wiped dry with paper towels and properly stored to prevent contamination between sampling locations.

4.6 Sampling Spoons, Trowels, or Scoops

- A. All buckets, brushes, spoons, spades or trowels will be cleaned with a non-phosphate detergent (e.g., *Liquinox*) solution and rinsed well with distilled water prior to sample collection.
- B. Two decontamination buckets will be prepared with an adequate amount of cleaning solution and one decontamination brush will be dedicated to each bucket.
- C. Vinyl, latex, or nitrile gloves will be worn.
- D. A two-stage decontamination process will be used. The grossly soiled sampling device will first be cleaned in the first bucket, rinsed with distilled water, then cleaned again in the second bucket and finally rinsed thoroughly with distilled water. The first bucket will be dedicated for removing the gross soil, sludge, or sediment.
- E. When the cleaning solution in the first bucket becomes dirty, the solution shall be properly discarded and the second bucket will replace the first. A new cleaning solution will be prepared in the original first bucket and it will now become the second bucket.

4.7 Monitoring Well/Piezometer/Ground-Water Extraction Well/Soil Vapor Probe/Vacuum Extraction Well Casing and Screen Pre-Installation Decontamination Procedures

This section documents the procedures that will be adhered to during the pre-installation decontamination of a monitoring well, piezometer, ground-water extraction well, soil vapor probe, and vacuum extraction well casings and screens and bottom caps. The following procedures apply to both PVC and Type 304 stainless steel casing and screen materials.

- A. All personnel handling the well materials will be wearing clean vinyl, nitrile or latex protective gloves.
- B. When the well casing and screen is removed from the packaging, the well materials will be placed on clean saw horses or an equivalent support device.

The well materials shall be washed with a clean stiff brush and a non-phosphatic soap solution (e.g., *Liquinox*).

- C. After the well materials are washed, they will be rinsed with potable water.
- D. A high pressure steam cleaner may then be used to thoroughly remove any remaining soap or soiled areas.
- E. The final step will be to rinse the well materials with distilled water. The well materials shall remain on the saw horses until well construction commences.

4.8 Interface Probe and Water Level Indicator

The entire length of the probe and tape that was inserted into the well will be decontaminated by washing with a non-phosphate detergent (e.g., *Liquinox*) and then rinsing with distilled water.

5.0 Documentation

The procedure(s) employed, date(s), and time(s) will be recorded on the appropriate documentation (e.g., daily field reports, field notebooks, boring logs, etc.). Any deviation from these procedures must be noted. Deviations must be approved by the Project Manager and Quality Assurance Officer.

6.0 Special Notes

None

7.0 Applicable Standards and References

None

SOP NO. F1006

Field Soil Classification/Description

SOP No. F1006
FIELD SOIL CLASSIFICATION/DESCRIPTION

1.0 Purpose

This section documents the procedures to visually classify soils in the field. All descriptions shall follow ASTM D653 and D2488. As a field guide, the attached table summarizes the parameters to properly classify a soil sample.

2.0 Equipment and Materials

- Pocket penetrometer
- Visual soil classification reference (e.g., attached table)
- Dropper bottle with diluted HCl

3.0 Procedures

In general, soil descriptions shall be written in the following format:

- density or consistency classification/color/second major constituent (adjective)/major constituent (principle noun)/minor constituents/moisture content/other characteristics

For example: hard brown silty clay with a trace of sand and gravel, moist, fractured.

Moisture contents may be written as: saturated, wet, very moist, moist, slightly moist, and dry.

Damp may be substituted for moist.

Other characteristics that should be mentioned are: fractures, fracture fillings, laminations, varves, organic content, oxidation, mineral fillings, sorting, and any evidence of potential contamination.

See attached Table.

4.0 Documentation

A sample identification will be documented on the soil boring logs.

5.0 Special Notes

None

6.0 Applicable Standards and References

None

HULL & ASSOCIATES, INC.
PROCEDURES FOR VISUAL SOIL CLASSIFICATION

TERMINOLOGY

Unless otherwise noted, all terms utilized herein refer to the Standard Definitions presented in ASTM D 653 and D 2488.

PARTICLE SIZES

Boulders	-	Greater than 12 inches (305mm)
Cobbles	-	3 inches (76.2mm) to 12 inches (305mm)
Gravel:	Coarse	3/4 inches (19.05mm) to 3 inches (76.2mm)
	Fine	No. 4 - 3/16 inches (4.75mm) to 3/4 inches (19.05mm)
Sand:	Coarse	No. 10 (2.00mm) to No. 4 (4.75mm)
	Medium	No. 40 (0.425mm) to No. 10 (2.00mm)
	Fine	No. 200 (0.074mm) to No. 40 (0.425mm)
Silt	-	0.005mm to 0.074mm
Clay	-	Less than 0.005mm

COHESIONLESS SOILS

Classification

Density Classification

Relative Density %

Approximate Range of (N)

The major soil constituent is the principle noun, i.e. sand, silt, gravel. The second major soil constituent and other minor constituents are reported as follows:

	Very Loose	0-15	0-4
Loose	16-35		5-10
	Medium Dense	36-65	11-30
	Dense	66-85	31-50
	Very Dense	86-100	Over 50

Second Major Constituent (percent by weight)

Minor Constituents (percent by weight)

Trace	-	1 to 12%	Trace	-	1 to 12%
Adjective	-	12 to 35%	Little	-	12 to 23%
		(clayey, silty, etc.)			
And	-	Over 35%	Some	-	23 to 33%

Relative Density of Cohesionless Soils is based upon an evaluation of the Standard Penetration Resistance (N), modified as required for depth effects, sampling effects, etc.

COHESIVE SOILS

If clay content is sufficient so that clay dominates soil properties, clay becomes the principal noun with the other major soil constituent as modifier; i.e., silty clay. Other minor soil constituents may be included in accordance with the classification breakdown for cohesionless soils; i.e., silty clay, trace of sand, little gravel.

Consistency

Unconfined Compressive Strength (psf)

Approximate Range of (N)

Very Soft	Below	500	0 - 2
Soft	500 -	1000	3 - 4
Medium Stiff	1000 -	2000	5 - 8
Stiff	2000 -	4000	9 - 15
Very Stiff	4000 -	8000	16 - 30
Hard	8000 -	16000	31 - 50
Very Hard	Over	16000	Over 50

Consistency of cohesive soils is based upon an evaluation of the observed resistance to deformation under load and not upon the Standard Penetration Resistance (N).

SAMPLE DESIGNATIONS

- AS - Auger Sample - Directly from auger flight.
- BS - Miscellaneous Samples - Bottle or Bag.
- S - Split Spoon Sample - ASTM D 1586-67.
- LS - Liner Sample S with liner insert 3 inches in length.
- ST - Shelby Tube Sample - 3 inch diameter unless otherwise noted.
- PS - Piston Sample - 3 inch diameter unless otherwise noted.
- RC - Rock Core - NX core unless otherwise noted.

STANDARD PENETRATION TEST (ASTM D 580): A 2.0" outside-diameter, 1-3/8" inside-diameter split barrel sampler is driven into undisturbed soil by means of a 140-pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven three successive 6-inch increments. The second and third blows are added to determine the Standard Penetration Resistance (N).

SOP NO. F1007

YSI Model 33 S-C-T Meter

SOP No. F1007
YSI MODEL 33 S-C-T METER

1.0 Purpose

This SOP documents the procedures that will be followed during field analysis of salinity, specific conductance, and temperature with the YSI Model 33 instrument. These parameters may be measured while purging wells to determine if equilibrium has been achieved, and should be measured after purging and before samples are collected for laboratory analysis.

2.0 Equipment and Materials

- YSI Model 33 S-C-T Meter and instrument logbook.
- YSI Model 3300 series conductivity/temperature probe; 1.0 cell constant.
- Potassium Chloride (KCl) standardization solution
- Chart of Temperature Conversions for Correcting Specific Conductivity (in Degrees Celsius)
- Distilled water and *Liquinox*.

3.0 Procedures

A. Calibration

1. The meter correction factor (MCF) will be determined monthly. The conductivity cell will be rinsed with at least three portions of KCl solution. The temperature of a fourth portion will be adjusted to $25.0 \pm 0.1^{\circ}\text{C}$. Four separate measurements will be recorded and the results averaged (Cond.). The conductivity readings will be expressed in microsiemens per centimeter (mS/cm). The temperature will be recorded in degrees Celsius ($^{\circ}\text{C}$). The MCF will be calculated as follows:

$$\text{MCF} = \frac{[\text{concentration of standardization solution}]}{[\text{Cond.}]}$$

2. The calibration data and the MCF will be recorded in an instrument logbook. An instrument logbook will be kept with the instrument to document any time any employee calibrates or adjusts the equipment.

B. Setup

1. The meter will be adjusted to zero (if necessary) by turning the bakelite screw on the meter face so that the meter needle coincides with the zero on the conductivity scale.
2. The meter will be calibrated by turning the MODE control to REDLINE and adjusting the REDLINE control so the meter needle lines up with the redline on the meter face. If this cannot be accomplished, the batteries should be replaced.

3. The probe will be plugged into the probe jack on the side of the instrument.
4. The probe will be inserted in the solution to be measured.

C. Temperature

1. The MODE control will be set to TEMPERATURE. The probe temperature will be allowed to come to equilibrium with that of the solution before reading. The temperature will be read on the bottom scale of the meter in degrees Celsius.

D. Conductivity

1. The meter scale will be switched to X100. If the reading is below 50 on the 0-500 mS/cm range (or 5.0 on the 0-50 mS/cm range), the meter will be switched to X10. If the reading is still below 50 (or 5.0 mS/cm), the meter will be switched to the X1 scale. The meter will be read and the reading multiplied by the appropriate scale factor. The measurements are not temperature compensated; therefore, the field value will be adjusted by finding the appropriate temperature correction factor (TCF) from the chart labelled Temperature Conversions for Correcting Specific Conductivity (in Degrees Celsius) for the actual temperature of the measured solution. The field value will then be multiplied by the MCF and divided by the TCF.

EXAMPLE: (assume a MCF of 0.98 and a TCF of 0.7651)

Meter Reading: 247 mS/cm
Scale: X10
Field Value: 2470 mS/cm

Conductivity: $2470 \times \frac{0.98}{0.7651} = 3164 \text{ mS/cm}$

2. When measuring on the X100 and X10 meter scales, the CELL TEST button will be depressed. The meter reading should fall less than 2 percent. If the fall is greater, the probe is fouled and the measurement is in error. The probe will be cleaned and the conductivity re-measured.

NOTE: The CELL TEST will not function on the X1 scale.

E. Salinity

1. The sample temperature will be determined and the temperature dial adjusted to that value.
2. The meter scale will be switched to X100. If the reading is above 500 mS/cm, the salinity value is beyond the measurement range.

3. If the reading is in range, the meter will be switched to SALINITY and the salinity will be read on the red 0-40 parts per thousand (ppt) meter scale.
4. The CELL TEST button will be depressed. The fall in meter reading should be less than 2 percent. If the fall is greater, the probe is fouled and the measurement is in error. The probe will be cleaned and the salinity re-measured.

4.0 Documentation

The cell constant/correction factor (CF) should be determined monthly. All calibration data and the CF will be recorded in the instrument logbook and on the standard data sheet and given to the supervisor for inclusion in the monthly QC report. All sample measurements shall be recorded on the Ground-water Monitoring Well Data Sheet.

5.0 Special Notes

Quality Control

1. The redline mode will be checked prior to sample analysis.
2. A duplicate will be run for every 10 samples.
3. The calibration will be checked monthly.

Troubleshooting

1. The instrument settings and calculations will be checked.
2. The cell will be cleaned and inspected. See your supervisor and the cell instruction booklet.
3. The batteries will be replaced.
4. The calibration will be re-checked.
5. Any unresolved problems will be reported to the supervisor.
6. All problems and steps will be recorded in the instrument logbook and on an appropriate HAI field form.

6.0 Applicable Standards and References

Yellow Springs, Inc., Model 33 S-C-T Meter Operation Manual

SOP NO. F1008

Orion 230A pH and Temperature Meter

SOP NO. 1008
ORION 230A pH AND TEMPERATURE METER

1.0 Purpose

This section documents the procedures that will be followed during field analysis of pH and temperature.

2.0 Equipment and Materials

- *Orion 230A Digital pH and Temperature Meter*
- pH 4.0 buffer solution and container
- pH 7.0 buffer solution and container
- pH 10.0 buffer solution and container
- Electrode Filling and Electrode Storage Solutions
- Containers for Samples (e.g., glass jars)
- Distilled Water

3.0 Procedures

A. Prior to operating, a self-test will be performed as follows:

1. The BNC shorting plug will be attached to the BNC connector on top of meter.
2. The **Power** key will be depressed. If the battery indicator is displayed, the battery will be replaced.
3. The instrument will be turned off.
4. The **Power** key will be depressed and immediately the **yes** key will be depressed. The instrument will automatically perform electronic and hardware diagnostic tests. The main display will show 7E57 and the number on the bottom of the display indicates the test field being run. There will be eight test fields during this check.
5. After test field number seven, a "0" will appear on the display. Press each key on the panel in any order within ten seconds, and the self-test will be completed and the meter will automatically shut off.
6. The meter will be powered back on and it should read $7.0 \pm .02$ and 25°C . If this does not happen, refer to the operating manual (page 15) under Checkout Procedures (model 230A).

B. The meter will be manually calibrated with two buffers as follows:

1. The probe will be attached to the instrument attaching the BNC to the sensor input, pushing down, and turning clockwise to lock. The ATC plug will be firmly attached. The protective cap will be removed from the sensor end of the probe. If the expected pH of the sample is less than 7.0, the pH 4.0 and 7.0 buffer solutions will be used. If the expected pH of the sample is greater than 7.0, the pH 7.0 and 10.0 buffer solutions will be used.

* The sensor is very sensitive and should be kept in distilled water between samples and when not in use while in the field. Extreme care must be exercised to prevent excessive shock to this instrument and probe.

2. The pH electrode will be repeatedly rinsed with distilled water.
3. The electrode will be placed into the first buffer solution.
4. The instrument will be turned on and the **Cal** key will be depressed. The word **Calibrate** will be displayed above the main readout and **P1** will be displayed in the lower field which indicates point one of calibration.
5. When the instrument has reached a stable reading, **Ready** will be displayed. Either of the keys with a blue arrow will be depressed and the first digit will start flashing. The arrow keys will be used to display the correct value and the **Yes** key will be depressed. The second digit will start flashing. This process will be continued until all the digits have been correctly entered. The display will remain frozen for two seconds, then **P2** will be displayed in the lower field indicating the meter is ready for the second point of calibration.
6. The electrode will be rinsed with distilled water and placed in the second buffer. Step 5 will be repeated for the second buffer value.
7. The electrode slope will then be displayed in the main field with **SLP** in the lower field. The slope should be 92% to 102%. If the slope is out of range, contact *Orion's* service department for required actions.

C. A sample will be analyzed as follows:

1. The instrument will be calibrated in accordance with Section B.
2. The electrode will be thoroughly rinsed with distilled water prior to measuring the sample.
3. The electrode will be placed into the sample. When the display indicates **Ready**, the pH and temperature readings will be recorded. This model automatically adjusts the pH reading based on a temperature of 25 degrees Celsius. The actual temperature of the sample will be displayed.

4. The probe will be rinsed and placed into distilled water between each sample.

D. The instrument will be prepared for storage as follows:

1. The instrument will be turned off.
2. The electrode will be disconnected from the instrument.
3. The probe will be rinsed with distilled water. The electrode protective cap will be filled with the storage solution and the cap placed on the end of the electrode.
4. The battery will be removed from the instrument.

* The storage solution should not be confused with the filling solution used for the interior of the electrode. The filling solution will be replaced periodically in-house by the Equipment Manager. The instrument should not be used for 24 hours after changing the filling solution.

E. The following maintenance requirements are noted:

1. The pH electrode must always have filling solution in the probe. The level of filling solution must always be above the reference junction and at least one inch above the sample level on immersion. The fill hole should not be covered whenever the electrode is in use.
2. The tip of the pH electrode is very fragile and must be kept moist at all times. Fill the plastic cap with the storage solution, and place cap on the electrode for storage.

4.0 Documentation

At a minimum, the data will be recorded in a field book or the Ground-Water Data Sheet. Additional documentation may be required by the Project Manager.

5.0 Special Notes

The pH/temperature meter is very sensitive to extreme heat and especially cold conditions (< 4°C). It is important to keep the meter in a temperature controlled environment (e.g., inside the cab of the truck).

6.0 Applicable Standards and References

ORION Laboratory Group Portable pH/ISE Meters Instruction Manual

SOP NO. F2002

Decommissioning of Overburden/Glacial Geotechnical Soil Bearings

SOP No. F2002
DECOMMISSIONING OF OVERBURDEN/GLACIAL GEOTECHNICAL SOIL BORINGS

1.0 Purpose

This section documents procedures to decommission geotechnical borings drilled entirely in glacial/overburden material.

2.0 Equipment and Materials

- Drilling rig with hollow-stem augers or drive/spin casing
- Sodium-bentonite or cement-bentonite slurry
- Concrete

3.0 Procedures

- A. The geotechnical boring to be decommissioned will be sealed by using a thick slurry mixture of sodium-bentonite or cement-bentonite slurry, which is injected at the bottom of the borehole using a tremie pipe. The casing or auger stem will be periodically filled as a section of the casing or augers is withdrawn to maintain a continuous seal. When completed, the slurry will be allowed to settle for approximately 18 to 24 hours. The borehole will then be reinspected and additional grout will be added if necessary.
- B. After the slurry has reached a static level, the remaining annular space will be sealed with approximately three feet of concrete (in traffic areas). In areas which can support vegetative growth, the slurry will be leveled at approximately two feet below ground surface. The remaining two feet will then be filled with topsoil.

4.0 Documentation

All pertinent data such as the total depth of drilling, the amount of slurry used, the mixture of slurry used, the thickness of the slurry column, and the thickness of the concrete plug will be recorded on the soil boring log. The decommissioning of any geotechnical soil boring shall be performed under prior approval of the Project Manager.

5.0 Special Notes

If a new boring and/or monitoring well is installed, it will be placed approximately ten feet away and hydraulically upgradient from the previous location to prevent any potential effect of the sodium-bentonite slurry on the ground-water quality.

6.0 Applicable Standards and References

None

SOP NO. F3011

Surface-Water Sample Collection

SOP No. F3011
SURFACE-WATER SAMPLE COLLECTION

1.0 Purpose

This section documents the procedures for collecting water samples from surface water and outfalls.

2.0 Equipment and Materials

- Sample vials for VOC analysis
- pH meter
- Specific conductivity meter
- Thermometer
- Latex gloves
- Shipping cooler
- 500 ml sampling jar

3.0 Procedures

- A. The sample vial will be submerged in the flowing stream. The vial's mouth should be positioned so that it faces upstream while the sampling personnel are standing downstream. **NOTE:** If preservatives are to be added to the sample, the sample container cannot be utilized as the sampling device. A certified clean glass laboratory jar with a minimum volume of 500 ml shall be utilized as the sampling device.
- B. A sample will be collected from the flowing stream and the sample stream will be allowed to flow gently down the side of the jar with minimal entry turbulence.
- C. Delivery of the sample will continue until the jar is completely full. The sample will then be transferred from the sample jar to the vial. A convex meniscus should form on the mouth of the vial. The vial will be capped tightly to eliminate headspace and the sealed vials will be checked for air bubbles by inverting them and tapping gently against the wrist.
- D. The sample vials will be preserved and labeled at the sampling location.
- E. After all samples have been collected, field determination of pH, conductivity, and temperature will be made, if required. All samples will be properly packed in the shipping cooler prior to leaving the sampling location.
- F. Finally, all materials used during sample collection must be either properly disposed, or in the case of reusable equipment, must be properly decontaminated following the procedures documented in HAI SOP No. F1000.

4.0 Documentation

A number of different documents should be completed and maintained as part of the sampling effort. The documents must provide a summary of the sample-collection procedures and conditions, shipment method, the analyses requested, and the custody history. The following is a list of the documents that must be filled out:

- Water sample collection record/field notebook
- Sample labels
- Chain-of-custody records
- Shipping receipt (e.g., Fed Ex receipt)

5.0 Special Notes

None

6.0 Applicable Standards and References

None

SOP NO. F3014

Chain-of-Custody Procedures

SOP No. F3014
CHAIN-OF-CUSTODY PROCEDURES

1.0 Purpose

This SOP documents the chain-of-custody (COC) procedures that will be employed during all sampling activities.

2.0 Equipment and Materials

- Indelible ink ball-point pens
- Chain-of-custody records
- One-gallon size *Zip-Loc* (or equivalent) storage bags

3.0 General

A completed COC record must accompany every sample from the point of collection to delivery to the laboratory. A single COC record may accompany several samples as long as all the samples are contained in a single unit (e.g., cooler, box, etc.). All COCs will be kept in one-gallon *Zip-Loc* bags to prevent damage from melting ice, broken samples, and bad weather. A copy of every completed COC record will be maintained by the Quality Assurance Officer (QAO).

4.0 Procedures

4.1 Completion of COC Record

- A. The COC record is initiated in the field by the sampler(s) immediately after a sample is collected. Figure F3014-1 illustrates a properly completed COC.
- B. The sample identification number of the sample will be recorded in the box labeled "Sample Identification".
- C. Next, the appropriate sample matrix will be indicated by completing the box labeled "Sample Matrix" with the number that corresponds to the sample matrix type. Sample matrices are listed near the top of the COC record.
- D. The number of containers that makes a complete sample will be recorded in the box labeled "No. of Containers".
- E. If the sample is to be analyzed for metals, the box labeled "Metals" shall be completed to indicate whether the sample fractions for metals have been filtered. A "F" will be used to indicate that the metals were filtered and a "N" will indicate that they were not filtered. Occasionally, some samples may require metal fractions to be filtered and not filtered (e.g., analyses for dissolved and total metals). In this case a "B" will be used

to indicate that the sample contains both filtered and non-filtered fractions. If the sample does not require analyses for metals a single line will be drawn through this box.

- F. The date and time (military) of sample collection will be recorded in the box labeled "Sampling Date/Time".
- G. The requested analytical methods will be recorded in the diagonal spaces provided under the box labeled "Analyses". The preservatives added to the containers for each analytical method will be indicated by recording the letter in the box labeled "Preservatives" that corresponds to the preservative added. The preservatives and corresponding letters are listed near the top of the COC record. Finally, a check mark(s) will be made under each fraction for which a particular sample will be analyzed.
- H. Any comments relating to the collected sample(s) can be recorded in the box labeled "Comments". These comments may indicate special handling or analytical instructions for the laboratory (e.g., compositing instructions) or may be used to indicate the location of sample collection.
- I. Additional information required on the COC record includes the person the analytical reports should be sent to, client, site, project description, project number, names of all samplers involved in sample collection, where the samples are to be delivered, method of delivery, and airbill number (if applicable).

4.2 Transfer of Custody

- A. The COC record must document the transfer of custody each time the sample(s) changes hands. The National Enforcement Investigations Center (NEIC) of the EPA defines custody as:
 - 1. the sample is in your physical possession;
 - 2. the sample is within view after being in your physical possession;
 - 3. the sample was in your possession and then you locked it or sealed it to prevent tampering; and/or
 - 4. the sample is placed in a designated secure place with limited access to authorized personnel only.
- B. When transferring custody of samples, the person in custody (e.g., the sampler) must sign the box labeled "Relinquished By" and fill in the date and time (military time) the custody of the samples was relinquished. The person accepting custody of the samples must then sign the box labeled "Received By" and complete the date and time (military time) the custody of the samples was accepted.

- C. The above procedures must be followed until the samples are delivered to the laboratory. In cases where a commercial courier (e.g., Federal Express) is used to deliver the samples, the person relinquishing custody to the courier should put the name of the courier in the "Received By" box and seal the COC inside the cooler. Most couriers have a policy against signing for custody of samples.
- D. The pink copy (bottom) of the COC will be retained before the samples are shipped and the remaining copies (white and yellow) of the COC are delivered to the laboratory. The pink copy will then be immediately given to the QAO. The white copy will be returned by the laboratory with the final report.

5.0 Documentation

Chain-of-custody record

6.0 Special Notes

None

7.0 Applicable Standards and References

U.S. Environmental Protection Agency. NEIC Policies and Procedures. EPA-330/9-78-001-R. May 1978. (Revised February 1983.)

U.S. Environmental Protection Agency. User's Guide to the Contract Laboratory Program. Office of Emergency and Remedial Response. December 1986.

U.S. Environmental Protection Agency. A Compendium of Superfund Field Operations Methods. EPA/540/P-87/001, December 1987.



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REPORT TO: K. Wildman

WHITE -- ORIGINAL
PINK -- LAB USE
YELLOW -- LAB USE (MUST BE RETURNED W/ REPORT)

(Please forward results to address at top left)

Client: ABC COMPANY Site: ANYTOWN, OHIO
Project: GW SAMPLING Project #: ABCA1
Samplers: J. Small, T. Large

[illegible]

FIGURE F3014-1

Hull & Associates, Inc.

CHAIN OF CUSTODY RECORD

DATE: AUGUST 1993

STD

SOP NO. F3017

Surface and Shallow Subsurface Soil, Sludge, or Sediment Sampling (Not Submerged)

SOP No. F3017
SURFACE AND SHALLOW SUBSURFACE SOIL, SLUDGE, OR SEDIMENT
SAMPLING (NOT SUBMERGED)

1.0 Purpose

The following procedure will be followed when collecting surface and near-surface soil, sludge, or sediment samples for chemical analyses. The method is limited to sampling near surface sample locations that are not located beneath a liquid surface.

2.0 Equipment and Materials

- Stainless steel sampling spoon, trowel, or scoop (not plated or painted)
- Stainless steel spade or trowel (not plated or painted)
- Stainless steel mixing bowl or *Teflon* tray
- Sample containers
- Latex or vinyl sampling gloves
- Decontamination supplies

3.0 Procedures

Discrete Samples

- A. All sampling equipment will be decontaminated prior to use in accordance with the procedures specified in SOP No. F1000.
- B. If a shallow subsurface sample is desired, the precleaned trowel or spade will be used to remove the top layer of soil to the desired sample depth.
- C. A thin layer of soil from the area which comes in contact with the trowel or spade will be removed with the pre-cleaned sampling device (e.g., spoon) and discarded.
- D. The sample will be collected with the pre-cleaned sampling device and placed into an appropriate sample container.
- E. The sample container will be labeled with the appropriate information. All chain-of-custody documents will be completed and the appropriate information recorded in the field log book or report form.
- F. The labeled sample container will be placed in an appropriate transport container with ice (if required) as soon as possible.
- G. All sampling equipment will be decontaminated after use in accordance with the procedures specified in SOP No. F1000.

Composite Samples

Discrete samples that comprise a composite sample will be collected as described above; however, a stainless steel mixing bowl or *Teflon* tray will be used for mixing the discrete samples prior to placing the sample in the laboratory-supplied sample containers.

4.0 Documentation

Each sample container will be labeled as directed by the project Work Plan or by the Project Manager and a chain-of-custody record will be completed. A field log book will also be kept describing the sampling procedures, the sample locations, all sample identification numbers, and any deviations from this SOP. An HAI Surface and Shallow Subsurface Soil Sampling Field Data Sheet or other designated field record form will be filled out. If possible, photographs may be taken of the sample jars prior to packaging for shipment, the sample locations, the sample equipment, or the sampling technique utilized by field personnel. A map or site sketch will be constructed of all sample locations using field measurements or from coordinates obtained from a qualified surveyor. If necessary, an elevation of the sample location will be obtained and referenced to an appropriate benchmark.

5.0 Special Notes

The decontamination process will be repeated after each use and between all discrete sample locations. If compositing strategies are used, decontamination may only be required between composite samples (i.e., not between discrete samples that form a single composite). Sample gloves will be changed in between each location.

6.0 Applicable Standards and References

U.S. EPA. Characterization of Hazardous Waste Sites, A Methods Manual - Vol. II, Available Sampling Methods. 2nd Ed. 12/84. EPA/600/4-84/076.

SOP NO. F3019

Submerged Sludge or Sediment Sampling

SOP No. F3019
SUBMERGED SLUDGE OR SEDIMENT SAMPLING

1.0 Purpose

The following procedure will be followed when collecting submerged samples of sludges or sediments. The method is limited to sample locations that are beneath a liquid surface.

2.0 Equipment and Materials

- *Ponar* grab sampler
- Nylon or polypropylene line or *Teflon* coated stainless steel cable
- Stainless steel mixing bowl or *Teflon* tray
- Stainless steel spoon or trowel (not plated or painted)
- Sample containers
- Latex or vinyl sampling gloves
- Decontamination supplies

3.0 Procedures

- A. All sampling equipment will be decontaminated prior to use in accordance with the procedures specified SOP No. F1000.
- B. The appropriate length of sample line will be attached to the decontaminated *Ponar* sampler. A 3/16 inch diameter braided line will normally provide sufficient strength; however, a 3/8 inch diameter line will allow easier hand hoisting.
- C. The distance beneath the surface to the sample location will be marked on the sample line. A second mark will be identified on the sample line that is approximately one meter less to indicate proximity to the sample depth. This will identify the depth where the lowering rate will be reduced to minimize unnecessary disturbance of the sludges or sediments. If sampling relatively shallow streams, the proximity mark (the second mark) is not required because the sampler will be lowered very slowly until the bottom is contacted.
- D. The free end of sample line will be tied to a fixed support to prevent the accidental loss of sampler. Allow sufficient slack in the line to perform sampling activities.
- E. The sampler jaws will be opened until they latch. From this point on, the sampler will be supported by it's sample line only or the sampler may be tripped and the jaws will close prematurely.
- F. The sampler will be lowered until the proximity mark (the first mark encountered) is reached.
- G. The rate of descent will be slowed through the last meter of fall until contact with the bottom is felt.

- H. The sample line will be allowed to slack several inches. In strong currents, more slack may be necessary to release the mechanism. In shallow streams, the top of the clamshells may be gently pushed with a probe to allow the clamshells to sink deeper into the sediments and maximize recovery.
- I. The sampler will be raised clear of the liquid surface.
- J. The sampler will be placed into a stainless steel or *Teflon* tray and opened. The sampler will be lifted clear of the tray.
- K. The sample will be collected with the pre-cleaned sampling device (e.g., spoon) and placed into an appropriate sample container.
- L. The sample container will be labelled with the appropriate information. All chain-of-custody documents will be completed and the appropriate information recorded in the field log book or report form.
- M. The labeled sample container will be placed in an appropriate transport container with ice packs (if required) as soon as possible.
- N. All sampling equipment will be decontaminated in accordance with the procedures specified in SOP No. F1000.

4.0 Documentation

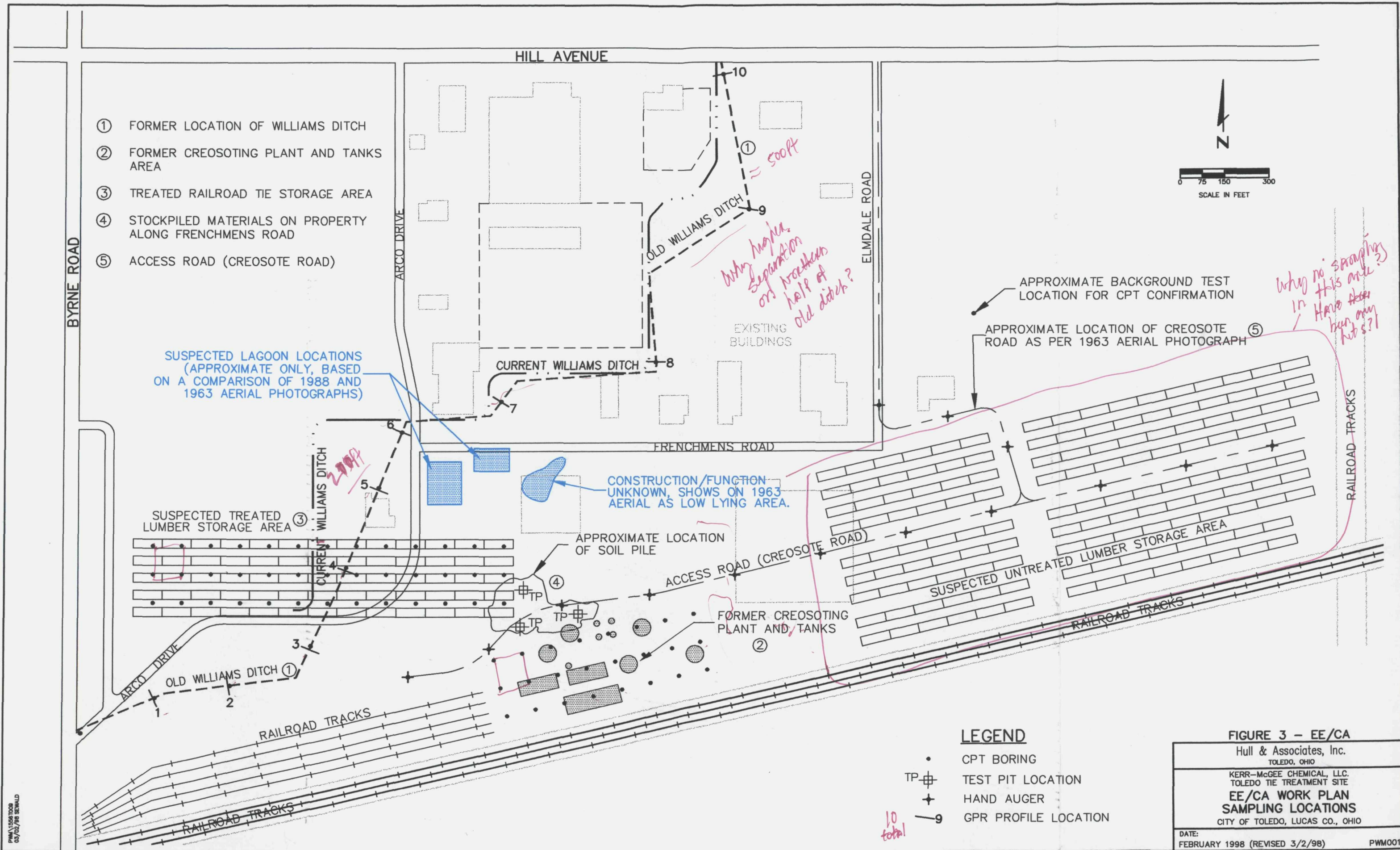
Each sample container will be labeled as directed by the project Work Plan or by the Project Manager and a chain-of-custody record will be completed. A field log book will also be kept describing the sampling procedures, the sample locations, all sample identification numbers, and any deviations from this SOP. A field record form or log book will be filled out. If possible, photographs may be taken of the sample jars prior to packaging for shipment, the sample locations, the sample equipment, or the sampling technique utilized by field personnel. A map or site sketch will be constructed of all sample locations using field measurements or from coordinates obtained from a qualified surveyor. If necessary, an elevation of the sample location will be obtained and referenced to an appropriate benchmark.

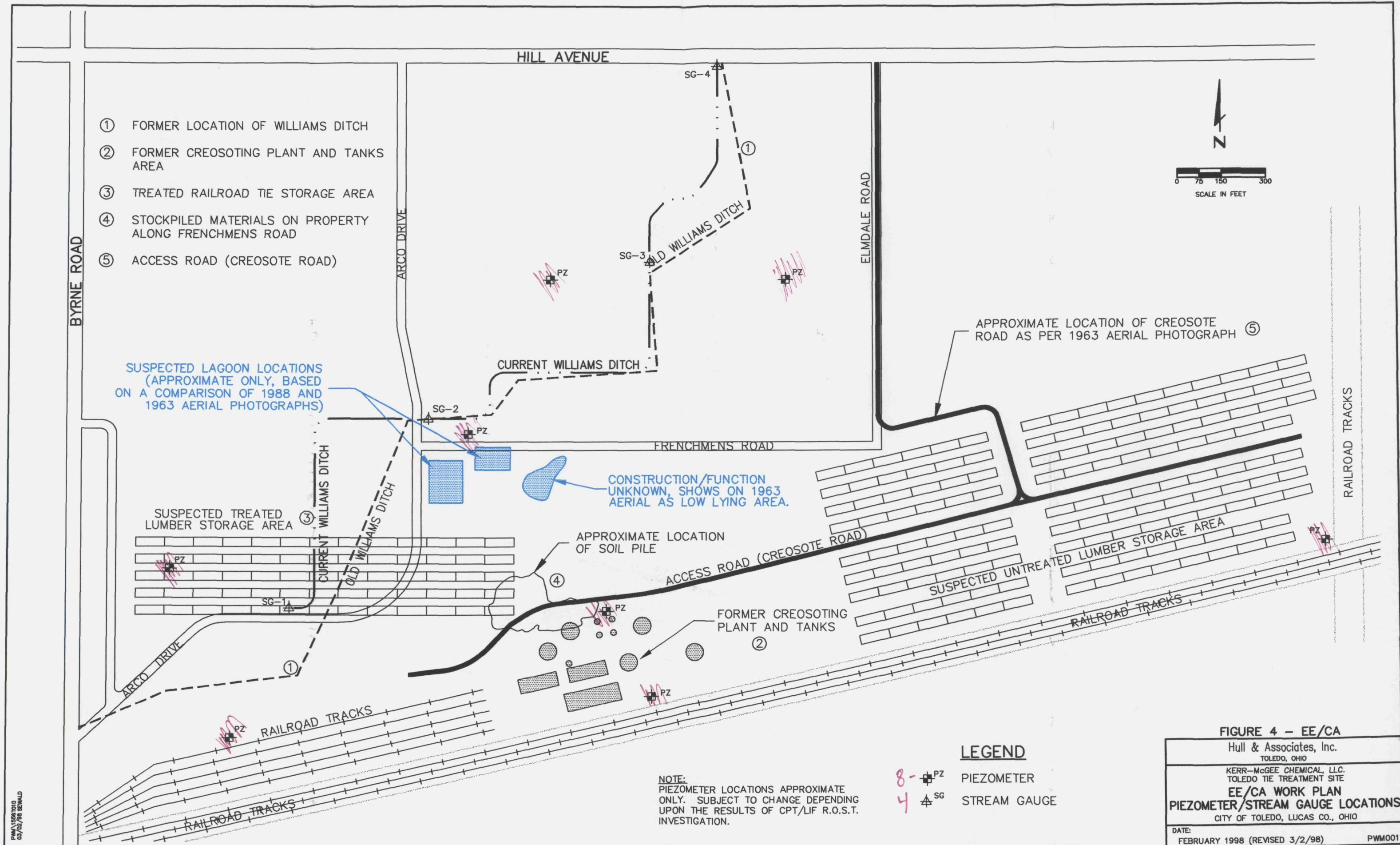
5.0 Special Notes

None

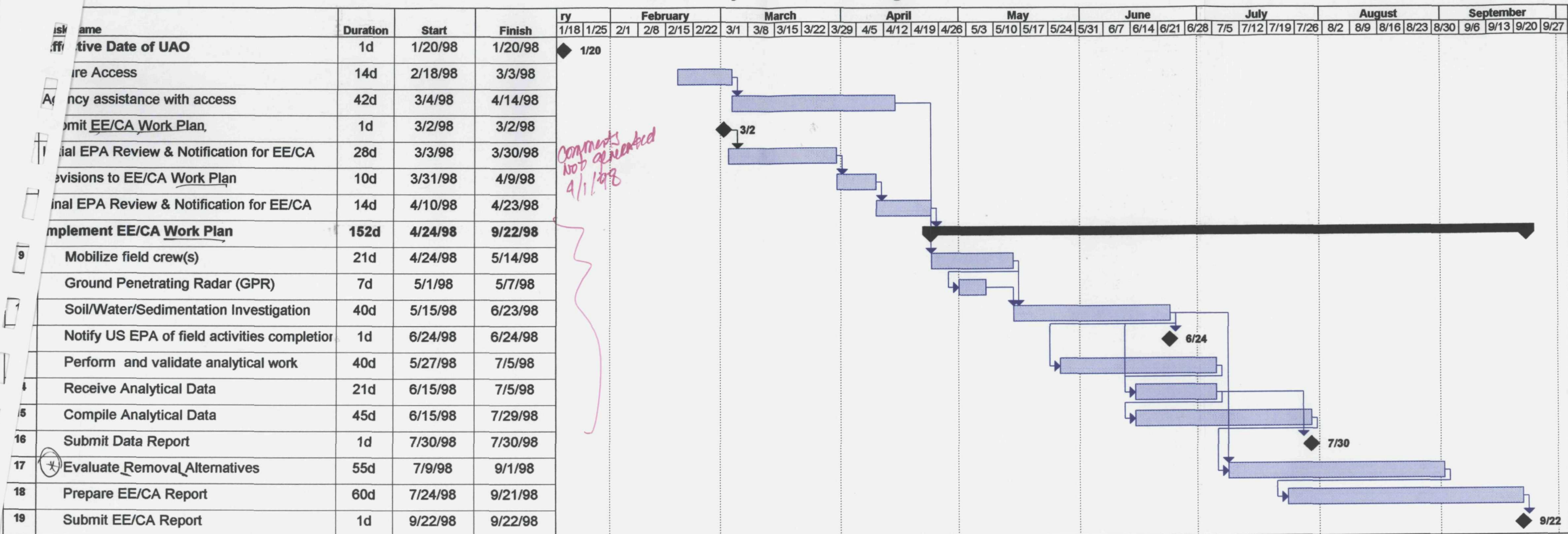
6.0 Applicable Standards and References

U.S.EPA. Characterization of Hazardous Waste Sites, A Methods Manual - Vol. II. Available Sampling Methods. 2nd Ed. 12/84. EPA/600/4-84-076.





**Kerr-McGee Chemical LLC
Toledo Tie Treatment Site
EE/CA Project Schedule - Figure 5**



update schedule

Project: EE/CA Work Plan
Project No.: PWM001
Date: 3/2/98

Task

Milestone

Summary

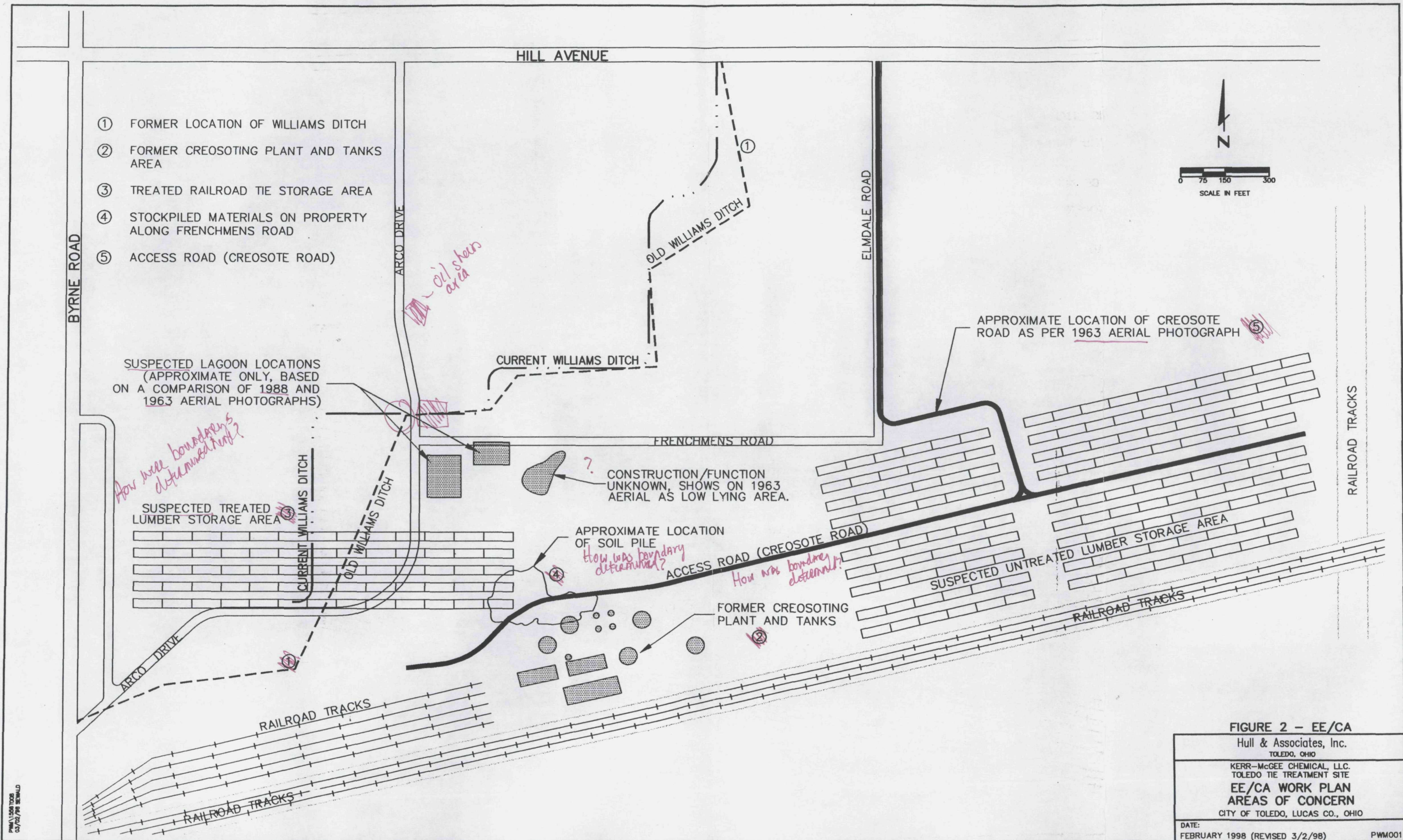


FIGURE 2 - EE/CA

Hull & Associates, Inc.
TOLEDO, OHIO

KERR-McGEE CHEMICAL, LLC.
TOLEDO TIE TREATMENT SITE
EE/CA WORK PLAN
AREAS OF CONCERN
CITY OF TOLEDO, LUCAS CO., OHIO

DATE:
FEBRUARY 1998 (REVISED 3/2/98)

PWM001